

THE CAMBRIAN TRILOBITES OF AUSTRALIA AND TASMANIA.

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PLATES XXXIX. AND XL.

I. INTRODUCTION.

The present communication is an attempt to condense our previous knowledge of the above group of organisms, and to suggest certain changes in nomenclature, as a basis for sounder elaboration by those who may come after and, with access to more complete and extensive material, engage in this interesting study.

The great drawback to a satisfactory elucidation of our Cambrian Trilobites lies in the imperfection of their remains as presented to us, seldom more than portion of a cephalon or pygidium, oftener simply fragments. Omitting the minute form *Agnostus elkedraensis*, I know of only one instance where the all-but complete body is preserved, that later described as *Ptychoparia alroiensis*.

The terms Lower and Upper Cambrian have been used by some in speaking of the rocks containing these old Crustaceans. I have not adopted these divisions in pages that follow, believing we know too little as yet of the Cambrian strata throughout Australia and Tasmania to warrant the use of stratigraphical subdivisions employed either in Europe or America. On the other hand, sufficient facts have already accumulated to justify the use of the term Cambrian simply for a vast thickness of beds, in all probability synchronal with those so termed in other parts of the world; in this sense it is here used. When it becomes possible to stratigraphically synchronize our oldest fossiliferous deposits, it will be more satisfactory to apply local group names, in other words, a sequence based on local facts and conditions. Two operations will accelerate this, detailed field work and energetic collecting.

With the view of recording the opinions of others, I have in each instance quoted the horizon assigned to a given species.

II. HISTORY.

1877.—So far as my researches have progressed, the first geologist to discover Trilobite remains in Australia, afterwards

shown to be of Cambrian age, was Mr. Otto Tepper.⁽¹⁾ We only know the bare fact that a Trilobite was found by him in the Parara Limestone, south of Parara Station. The exact horizon of this fossil was not made very clear, unless it occurred in the "variegated and dark-coloured limestone," or "white and yellow marbles."

1880.—The next in the field appears to have been our old friend Prof. Ralph Tate,⁽²⁾ who exhibited at a meeting of the Royal Society of South Australia, held on November 1, 1879, "a well-preserved head of a trilobite, which showed no traces of eyes," from the "Lower Silurian" of Ardrossan, Yorke Peninsula. It would be interesting to know if this was one of the specimens afterwards described by Tate in 1892.

1882.—In this year appeared a reference,⁽³⁾ probably by Prof. Tate, to the "head of a Trilobite" from Ardrossan, "apparently of the same species as previously found, but of a very much larger size. . . . The glabella is an inch and a quarter long and three-quarters wide, with three pairs of oblique furrows; its surface is ornamented with numerous close-set granules." It would also be interesting to ascertain the whereabouts of this specimen.

1882.—In this year there appeared the announcement of the occurrence of Cambrian Trilobites in Tasmania by myself, through specimens sent to me by Mr. Thomas Stephens, M.A., formerly Chief Inspector of Schools of that State. These were obtained from a decomposed ferruginous sandstone at Caroline Creek, near Latrobe,⁽⁴⁾ and consisted for the most part of fragments beyond determination. But amongst these was a cephalon described as *Conocephalites stephensi*, and a pygidium as *Dikelocephalus tasmaniensis*. With these were some interesting glabellae that I was, and still am, quite unable to satisfactorily refer to any genus within my knowledge.

This Caroline Creek sandstone was termed by Mr. R. M. Johnston⁽⁵⁾ the "Dikelocephalus Group" in his system of classification of Tasmanian rocks. He also stated that the first observer to draw attention to these fossils was Mr. Charles Gould in 1862, the then Government Geologist. By Mr. L.

(1) Tepper: "Introduction to the Cliffs and Rocks at Ardrossan," Trans. Phil. Soc. Adelaide, 1877-78 (1878), p. 77.

(2) Tate: Trans. Roy. Soc. S. Austr., iii., 1880, p. xiv.

(3) Anon.: Trans. Roy. Soc. S. Austr., iv., 1882, p. 145.

(4) Etheridge: Papers and Proc. Roy. Soc. Tas., 1882-83 (1883), p. 155.

(5) Johnston: Syst. Acc. Geol. Tas., 1888, p. 33.

K. Ward the Caroline Creek beds are said to "have been definitely referred to the Upper Cambrian."⁽⁶⁾

1884.—Dr. Henry Woodward described⁽⁷⁾ two imperfect cephalons from the Parara Limestone as *Dolichometopus tatei* and *Conocephalites australis*; he ascribed to them a Lower Silurian age. A re-examination of these specimens is necessary before it is practicable to say what they may be.

1888.—During this year I received from Mr. W. Howchin an Ardrossan cephalon, which I referred to *Ptychoparia* as *P. howchini*.⁽⁸⁾

1890.—The first Cambrian fossils collected in North-western Australia were obtained by Mr. E. T. Hardman,⁽⁹⁾ but for many years the exact source of these fossils was in doubt. This uncertainty has now been satisfactorily set at rest by a very careful and painstaking analysis of Hardman's reports and maps by Mr. L. Glauert,⁽¹⁰⁾ whose determinations are here adopted.

Hardman's fossils from the Ord River were first critically examined by myself at the British Museum in 1885, when I attached MS. names to several I intended to describe. Circumstances prevented this, but Mr. A. S. Foord⁽¹¹⁾ took up the work, and honoured me by adopting my MS. names. One, a Trilobite, was named *Olenellus forresti*.

The Ord River limestones are for the greater part hard and flaggy, rarely massive, usually grey in colour, sometimes sandy or magnesian, and seldom fossiliferous.⁽¹²⁾ But in places where the rock is fossil-bearing, it is crammed with the shells of a small supposed Pteropod (*Salterella hardmani*) and innumerable pieces and bits of Trilobites. From the prevalence of the little shells I have been in the habit of referring to this rock as the "Salterella Limestone."

(6) Ward: "The Geology of Tasmania: the Pre-Cambrian," Papers and Proc. Roy. Soc. Tas., 1909, p. 128.

(7) Woodward: Geol. Mag., i. (3), 1884, p. 342, pl. xi., figs. 2a, b, and 3.

(8) Etheridge: Trans. Roy. Soc. S. Austr., xxii., 1898, p. 1, pl. iv., figs. 1-3.

(9) Foord: Geol. Mag., vii. (3), 1890, p. 99.

(10) Glauert: Rec. W. Austr. Mus. and Art Gallery, i., pt. ii., 1912, p. 66.

(11) Foord: Geol. Mag., vii. (3), 1890, p. 99, pl. iv., figs. 2a, b, 3.

(12) Hardman: "2nd Rep. Geol. Kimberley Dist. W. Austr.," W. Austr. Parl. Papers, No. 34, 1885, p. 17, par. 124.

1892.—Prof. Tate described⁽¹³⁾ both Molluscan and Trilobite remains from another locality on Yorke Peninsula, Curramulka. The latter were called *Microdiscus subsagittatus* and *Olenellus pritchardi*. Both at this locality and at the typical one, Ardrossan, Tate regarded the beds as Lower Cambrian or “Olenellus Zone,” formerly termed by him Lower Silurian.

1895.—On the downs, five miles to the northward of Alexandria Cattle Station, Playford Creek, Northern Territory, in sinking a well, soft argillaceous rocks were met with to a depth of 200 feet. In the spoil from this well Mr. H. Y. L. Brown, the Government Geologist, found a Trilobite cephalon.⁽¹⁴⁾ This I described as *Olenellus browni*.⁽¹⁵⁾ The discovery and determination of this fossil, found in 1894, was the first definite record of the occurrence of Cambrian rocks in the Northern Territory.⁽¹⁶⁾ Mr. Brown cites a number of localities at which the lithological characters of this limestone formation are similar, and concludes by saying:—“The occurrence of Cambrian fossils near the Daly River and Alexandria Station proves that these widely-separated expanses of limestone are identical in age.”⁽¹⁷⁾ He had, however, previously stated his conviction that the limestone seen “at the Daly Telegraph Station, the Katherine River, and down the Victoria River was a continuation of that struck at the Alexandria Cattle Station bore.”⁽¹⁸⁾ In this limestone at the Katherine River, Dr. H. J. Jensen stated Mr. Brown found both *Salterella hardmani* and *Olenellus forresti*, but I am not acquainted with Brown’s reference.

1896.—In 1896 appeared a paper by myself in which I suggested the presence of Cambrian rocks at Mount Ida, near Heathcote, in Victoria, basing my opinion on the presence of some fragmentary but very interesting remains, to which I gave the name of *Dinesus ida*.⁽¹⁹⁾

1902.—Two additional Trilobites from a further Cambrian locality, about 150 miles south-west of Alexandria Old Cattle Station, were obtained by Mr. Brown, and described

(13) Tate: Trans. R. Soc. S. Austr., xv., pt. ii., 1892, p. 183, pl. ii., figs. 9, 11-13.

(14) Brown: “Report N. Territory Explorations,” S. Austr. Parl. Papers, No. 82, 1895, p. 24, chart 8.

(15) Etheridge: “Off. Contrib. Pal. S. Austr.,” No. 9, S. Austr. Parl. Papers, No. 127, 1897, p. 13, pl. i., fig. 1.

(16) Brown: “Northern Territory, etc., Reports Geological and General, 1905,” S. Austr. Parl. Papers, No. 55, 1906, p. 14.

(17) Northern Territory, *Ibid*, p. *id.*, p. 14.

(18) Brown: “Report N. Territory Explorations,” S. Austr. Parl. Papers, No. 82, 1895, p. 26.

(19) Etheridge: Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 56.

as *Agnostus elkedraensis* and *Microdiscus significans*.⁽²⁰⁾ The precise locality is the deserted cattle station of Elkedra, in Lat. 21° S., Long. 135°22' E.

1903.—Prof. J. W. Gregory, in a paper entitled “The Heathcoteian: a Preordovician Series and its Distribution.”⁽²¹⁾ described a further Trilobite from the Mount Ida beds as *Notasaphus fergusonii*. He expressed the opinion that my *Dinesus ida* comprised two forms, one of which he names as above, and further, that the deposit was not of Cambrian, but of Ordovician age.

The first record of organic remains in the Heathcote rocks was, I believe, by Prof. Sir F. McCoy, who recorded “cylindrical, flexuous markings, from one to two or scarcely three inches in length . . . usually attributed to annelid burrows, and are common in Cambrian rocks. . . . There is no reason for supposing from these specimens that the rock is older than Cambrian or Lower Silurian.”⁽²²⁾

Mr. E. Lidgey, in a report⁽²³⁾ on the general geology of the Heathcote Parish and others contiguous, refers to “micaceous mudstones containing casts of Trilobites,” members of these Lower Silurian rocks occupying rather less than one-fourth of the area reported on.

An important survey was made by Mr. W. H. Ferguson “for the purpose of defining the boundaries of an outcrop of Cambrian strata known to occur in the parish of Knowsley East. The Trilobite beds outcrop along the valley of Lady Creek and consist of “micaceous mudstones very rich in fossils.” From Mr. Ferguson’s remarks it is clear that the geology of this district is complicated and obscure.⁽²⁴⁾ By the late Mr. T. S. Hall these bed rocks were regarded as of Lower Silurian age, “but low down in the series near the Cambrian horizon.”

1904.—A further discovery of trilobite remains had been made about this time by Mr. Thomas Stephens⁽²⁵⁾ at the Florentine Valley, Humboldt Divide, West Tasmania. The fossils, casts of small Brachiopods, as well as those previously

(20) Etheridge: “Off. Contributions,” etc., Nos. 12 and 13, 1902, p. 3, pl. ii.

(21) Gregory: Proc. Roy. Soc. Vict., xv., (n.s.), pt. ii., 1903, p. 152.

(22) McCoy: Vict. Ann. Rep. Secy. Mines, 1891 (1892), p. 30.

(23) Lidgey: Geo. Survey Vict., Progress Report, viii., 1894, pp. 44 and 45.

(24) Ferguson: Geol. Survey Vict. (n.s.), No. 2, Monthly Progress Report, May, 1899, pp. 23-25.

(25) Etheridge: Rec. Austr. Mus., v., pt. 2, 1904, p. 98, pl. x.

mentioned, are preserved in a yellow, slightly micaceous, somewhat fissile mudstone. A well-marked pygidium I termed *Dikelocephalus florentinensis*, and two others were referred with some doubt to the genus *Niobe*.

The Florentine River is a tributary of the River Derwent. Mr. L. K. Ward speaks of these fossiliferous beds as the equivalents of the Caroline Creek deposit.

1905.—Not far from Wirriialpa, in the Flinders Range, Mr. Howchin discovered a shelly band in a flesh-coloured oolitic limestone, containing Brachiopoda and remains of Trilobites. One of these latter was described as a species of *Olenellus*.⁽²⁶⁾ This locality is in the vicinity of the Blinman Mines, about midway between Lake Torrens and the south end of Lake Frome.

1907.—To all interested in the Cambrian geology of South Australia, and possibly that of Australia generally, Mr. W. Howchin's paper, "A General Description of the Cambrian Strata of South Australia,"⁽²⁷⁾ will be invaluable. He divided the beds into Upper ("Purple-slate") Series and Lower Cambrian Series. With the exception of the Brighton radiolarian beds, the fossiliferous horizons are limited to two limestones high up in the upper division, as at Parara, Curramulka, Sellick Hill, Blinman, and Wirriialpa, etc. Howchin estimates the Archaeocyathinae Limestone, in which the South Australian Trilobites occur, together with Brachiopods, Pteropods, and a Calcareous Alga, to have formed "coral" reefs in the Cambrian sea from one hundred to two hundred feet in thickness.

1908.—A preliminary paper⁽²⁸⁾ by Mr. F. Chapman revealed the presence of trilobite remains at the Dolodrook River, Mount Wellington District, Gippsland, in a hard and sub-crystalline limestone. Three forms were recognizable—an *Agnostus*, a *Proetus*, and a *Cheirurus*. The age of this limestone was at this period left an open question.

1911.—In a further paper during 1911 Mr. Chapman elucidated these fragmentary remains,⁽²⁹⁾ and considered the limestone to be of Upper Cambrian age. The occurrence of *Agnostus* is confirmed; the *Proetus* represented two species of *Ptychoparia*, whilst the *Cheirurus* proved to be a *Crepicephalus*.

(26) Etheridge: Trans. Roy. Soc. S. Austr., xxix., 1905, p. 247.

(27) Howchin: Rep. Austr. Assoc. Ad. Sci., xi., 1907 (1908), p. 414.

(28) Chapman: Proc. Roy. Soc. Vict., xxi. (n.s.), pt. i., 1908, p. 268.

(29) Chapman: Proc. Roy. Soc. Vict., xxiii. (n.s.), pt. ii., 1911, p. 305.

According to Mr. E. O. Thiele there are two limestones, a "pale grey," containing Brachiopods and *Girvanella* and a "dark bluish-grey," with the crustacean fragments in question,⁽³⁰⁾ "sections cut in all directions," says Mr. Chapman. This fragmentary condition of such remains is not uncommon in our Cambrian rocks, particularly in the Kimberley limestones and the friable sandstone of Caroline Creek.

1915.—In the "Bulletin of the Northern Territory" for December, 1915, are photo-prints of a Trilobite cast, found by Mr. Surveyor Merrotsy on the Barkly Tableland, eight miles east of Alroy Downs; "the rock matrix is a cherty replacement of limestone,"⁽³¹⁾ which accords well with the lithological composition of the Ord River bed. This cast is described in the present communication as *Ptychoparia alroiensis*, and is the most perfect example of this group of animals yet found in the Australian Cambrian. Mr. Merrotsy's discovery is one of great importance, indicating a further extension eastwards in all probability of the series yielding *Olenellus forresti*, *O. browni*, *Agnostus elkedraensis*, etc.

1918.—Some years ago Mr. H. Y. L. Brown forwarded to me pieces of a grey-white limestone from Clinton, on the east side of Yorke Peninsula, at the head of Gulf St. Vincent. Throughout these limestone fragments are the broken-up remains of a Trilobite, which appears to me to be quite different from any one yet found in the Yorke Peninsula.

III. OBSERVATIONS ON THE SPECIES.

Genus AGNOSTUS, Brongniart, 1822

(Hist. Nat. Crust. Foss., 1822, p. 38).

AGNOSTUS ELKEDRAENSIS, Eth. *fil.*

A. elkedraensis, Eth., *fil.*: Off. Contributions Pal. S. Austr., No. 13 (S. Austr. Parl. Papers), 1902, p. 3, pl. ii., figs. 1-4.

Obs.—In addition to the comparisons already made in the above communication, attention may be called to another Cambrian species—*A. montis*, Matthew.⁽³²⁾ I have examined the specimens of this pretty Australian form, and cannot distinguish more than one thoracic segment. This absence of the second can hardly be a matter of development, as the normal number are acquired at a very early stage in the metamorphosis of the genus.

(30) Thiele: Proc. Roy. Soc. Vict., xxi. (n.s.), pt. i., 1908.

(31) Anon.: Bull. N. Territory, No. 14, 1915, pls. ii. and iii.

(32) Matthew: Trans. Roy. Soc. Canada. v. (2), 1899, p. 48, pl. i., f. 6.

Loc.—Forty miles south-east of Elkedra Cattle Station (deserted), about 150 miles south of Alexandria Cattle Station, Barkly Tableland.

Hor.—Cambrian (Etheridge).

AGNOSTUS AUSTRALIENSIS, Chapman.

(?) *Agnostus*, sp., Chapman: Proc. Roy. Soc. Viet., xxi. (n.s.), pt. i., 1908, p. 268.

Agnostus australiensis, Chapman: *Ibid*, xxiii. (n.s.), pt. ii., 1911, p. 314, pl. lviii., figs. 9, 11, 12.

Obs.—The pygidium in this species differs from that of *A. elkedraensis* in the presence of the incipient spines at the posterior angles, and apparently by the absence of tubercles on the two lobes of the glabella.

Loc.—Dolodrook River, Mount Wellington District, Gippsland, Victoria.

Hor.—Agnostus zone, Upper Cambrian (Chapman).

Genus MICRODISCUS, Salter, 1864 ⁽³³⁾

(Quart. Jour. Geol. Soc., xx., 1864, p. 237).

Obs.—The name *Microdiscus* has a strange history as related by Mr. C. D. Walcott, and may have to give way to that of *Pemphigaspis*:—"If *Pemphigaspis bullatus* proves to belong to the same group [as *Microdiscus*] . . . all the species now referred to *Microdiscus* would then be replaced by *Pemphigaspis*, as Emmon's original name of *Microdiscus* would not be retained, as it appears to have been founded on a specimen of the genus *Trinucleus*." ⁽³⁴⁾

Whilst the name *Microdiscus* is retained it must be ascribed to Salter, as explained by Lake. ⁽³⁵⁾

Only one species of this strange little genus has so far been discovered in Australian rocks.

MICRODISCUS SIGNIFICANS, Eth. *fl.*

M. significans, Eth. *fl.*: Off. Contrib. Pal. S. Austr., No. 13 (S. Austr. Parl. Papers), 1902, p. 3, pl. ii., figs. 5-9.

Obs.—I am not in possession of any additional information relating to *M. significans*, which appears to be a member of the *M. dawsoni-puctatus* group, or those forms possessing a well-marked backwardly-directed cervical spine and multi-segmented pygidium.

I have re-examined the type specimens in the light of Mr. Walcott's genus *Pagetia*, but I failed to find any trace of either "eye line" (pelpebral ridge) or eyes.

(33) Emended: Walcott. 1886; non *Microdiscus*, Emmons.

(34) Walcott: Bull. U.S. Geol. Survey, No. 30, 1886, p. 154.

(35) Lake: Mon. Brit. Cambrian Trilobites, pt. ii., 1907, p. 30.

To the original description may be added that the surface of each cheek rises into a low blunt tubercle.

Loc.—Associated with *Agnostus elkedraensis*.

Hor.—Cambrian (Etheridge).

Genus DINESUS, Eth. *fil.*, 1896

(Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 56).

DINESUS IDA, Eth. *fil.*

D. ida, Eth. *fil.*: *Ibid*, p. 56, pl. i.

D. ida, Gregory: *Ibid*, xv. (n.s.), pt. ii., 1903, p. 155, pl. xxvi., figs. 8-10.

Obs.—On the subject of the fragmentary remains of this Trilobite, Mr. C. D. Walcott remarked:—"The genus *Dinesus*, Etheridge, jr., appears to be more nearly related to *Damesella* or *Dorypygella*, Walcott. Its marked characteristics are: the elongate oval glabella with the small, distinct antero-lateral and postero-lateral lobes; the small palpebral lobes; and the large pygidium with a spinose border."⁽³⁶⁾ A comparison with *Dorypyge* and several other genera will be found in the original description.

Prof. J. W. Gregory would combine the pygidia described by me as those of *D. ida* with his *Notasaphus fergusoni*, but too little of both these forms is at present known to define their respective limits.

Loc.—Near Mount Ida, near Heathcote, Victoria.

Hor.—Cambrian (Etheridge); Ordovician (Gregory); Cambrian or Lower Silurian (McCoy); Lower Silurian, "low down" (T. S. Hall).

Genus OLENELLUS, J. Hall, 1862

(15th Ann. Rep. N. York State Cab. Nat. Hist., 1862, p. 114).

OLENELLUS (?) BROWNI, Eth. *fil.*

O. browni, Eth. *fil.*: Off. Contributions Pal. S. Austr., No. 9 (S. Austr. Parl. Papers, 1897, No. 127), 1897, p. 13, pl. i., fig. 1.

Obs.—It is impossible to assign this Trilobite to its correct generic position pending the discovery of more complete material, especially the pygidium, the structure of which would at once decide the question. So far as the characters are decipherable they appear to be those of *Olenellus*, more particularly from the fact that through the absence of facial sutures the "free cheeks" are in one with the other parts of the cephalic shield.

Loc.—Alexandria Cattle Station, Playford Creek, Barkly Tableland (110 miles north-west of Camowéal).

Hor.—Cambrian (Etheridge).

(36) Walcott: Proc. U.S.A. Nat. Mus., xxix., 1905, p. 35.

OLENELLUS(?), sp.

Pl. xxxix., fig. 1.

Olenellus, sp., Etheridge: Trans. Roy. Soc. S. Austr., xxix., 1905, p. 247, pl. xxv., fig. 1.

Obs.—At present I am unable to refer this imperfect portion of a cephalon to any definite genus. The published figure does not convey a correct idea of the anterior outline, but represents the specimen terminating at the anterior margin of the glabella, whereas there is, in reality, portion of a wide concave area, anterior to the glabella, as in many other Trilobites; this alters the whole aspect of the specimen. There are but two pairs of furrows, instead of three, as I said in my former description, the basal pair complete and extending across the glabella, and an anterior pair very faintly marked, mere "nicks," in the axial furrows.

This imperfect glabella may be, as suggested by Mr. F. Chapman, an example of his *Ptychoparia thielei*, but before adopting this suggestion I prefer to await additional and more perfect material.

Loc.—Neighbourhood of Wirrialpa, Flinders Range, South Australia (Howchin).

Hor.—Cambrian (Etheridge).

Genus PTYCHOPARIA, Corda, 1847

(Prod. Mon. böhm. Trilobiten, 1847, p. 25).

PTYCHOPARIA (?) TATEI, H. Woodward.

Pl. xxxix., figs. 2 and 3.

Dolichometopus tatei, H. Woodward: Geol. Mag., i. (3), 1884, p. 344, pl. xi., fig. 3.

Olenellus pritchardi. Tate: Trans. Roy. Soc. S. Austr., xv., pt. 2, 1892, p. 187, pl. ii., fig. 12.

Redlichia tatei, Walcott: Smithsonian Miscel. Collns., 64, No. 5, 1916, p. 539.

Sp. Chars.—Cephalon very minute, in all probability semicircular; glabella oblong and narrow, very slightly conical, arched, and apparently unfurrowed; axial furrows deeply impressed laterally, but interrupted at the distal end of the glabella by a low bridge, which crosses the anterior area to the cephalon-limb border, the area concave, and both it and the border wide. Fixed cheeks somewhat cornute in outline; ocular ridges, or "eye-lines" describing a wide obtuse curve, broad and prominent; neck ring lobate, deep; free cheeks unknown.

Obs.—The two first records of the above synonymy are founded on the study of four specimens: firstly, a replica of Dr. H. Woodward's *Dolichometopus tatei*, very kindly supplied by Dr. Smith Woodward; and secondly, Tate's three

type specimens of *O. pritchardi*, lent to me with great cordiality by Prof. W. Howchin.

I am quite unable to separate the above cephalons; I believe them to represent one and the same species. I do not quite follow Mr. Walcott in his reference of "*Dolichometopus tatei*" to the genus *Redlichia*. The fixed cheeks are so differently shaped, the direction of the ocular ridges so dissimilar, that the courses of the facial sutures must have been quite unlike those of the Indian genus. At the same time I am by no means satisfied by merely placing these partial cephalons in *Ptychoparia*.

On looking round for a similar structure to that I have here termed a "bridge," uniting the anterior end of the glabella to the limb border, the genera *Alokistocare*⁽³⁷⁾ and *Acrocephalites*⁽³⁸⁾ obtrude themselves. In the former, "a low rounded boss occurs in front of the glabella, that usually extends across the frontal limb (area) on to the frontal rim so as to interrupt the furrow delimiting the two"; the boss appears to be variable in development according to species. In the latter of the two foregoing genera this bridge is referred to as "a knob-shaped elevation," but in a cephalon placed in this genus with reservation by Mr. Walcott, the glabella is connected with the limb by a well-defined narrow median ridge.

Loc.—Curramulka (or Parara[?]), Yorke Peninsula, South Australia (Tate).

Hor.—Parara Limestone, Lower Cambrian (Tate); Upper Cambrian (Howchin); Cambrian (Etheridge).

PTYCHOPARIA(?) SUBSAGITTATUS, Tate.

Pl. xxxix., figs. 4 and 5.

Microdiscus subsagittatus, Tate: Trans. Roy. Soc. S. Austr., xv., pt. 2, 1892, p. 187, pl. ii., fig. 12.

Obs.—Tate's "*Microdiscus subsagittatus*" has no connection with the genus of that name. I have before me Tate's two specimens and two others lent to me by Prof. Howchin.

The resemblance between Tate's examples of his "*Olenellus pritchardi*" and "*Microdiscus subsagittatus*" is remarkable. In neither of the two type specimens of the latter is the true outline of the cephalon shown, but the fixed cheeks are slightly more cornute than in "*O. pritchardi*," the ocular ridges somewhat more sigmoidal. What, however, is of more

⁽³⁷⁾ Walcott: Smithsonian Miscel. Collns., 64, No. 3, 1916, p. 182.

⁽³⁸⁾ Walcott: *Ibid*, p. 174.

importance is the occurrence of traces of three pairs of very minute, ill-defined, and perhaps continuous glabella furrows. In the latter characters the replica of "*Dolichometopus tatei*" and the three examples of "*Olenellus pritchardi*" are indecisive; the neck ring of the most perfect of the *M. subsagittatus* specimens displays a well-marked central tubercle.

For some time I regarded these three—"Dolichometopus tatei," "*Olenellus pritchardi*," and "*Microdiscus subsagittatus*"—as one and the same, and I am not even now sure that I have done right in separating the last named from the other two; however, this course will probably please those who deal in microscopic specific differences.

Of Tate's illustrations that of "*O. pritchardi*" is substantially correct, but that of "*M. subsagittatus*" is imaginary.

Loc. and Hor.—Similar to last.

There is evidence of yet another Trilobite in these Yorke Peninsula Cambrian beds, as previously stated. Some years ago Mr. H. Y. L. Brown, late Government Geologist, presented to the Australian Museum examples of a whitish-grey limestone from Clinton, near the north-west corner of Gulf St. Vincent. Scattered throughout these hand specimens are portions of cephalons, thoracic segments, etc., but all fragmentary.

The glabella was of the same elongately-oblong type, slightly narrowing forwards as in the two last described forms. There are three pairs of furrows, the basal pair circumscribed, the two anterior pairs short, deep, and apparently not complete. The anterior area was very wide, concave, and with upturned limb, and, so far as I can see, an absence of the bridge uniting the anterior end of the glabella with the limb. The fixed cheeks are deltoid more or less; neck-ring wide with a central backwardly directed spine; the whole surface is minutely granular.

I do not think this can possibly be identical with any of the previously described cephalons, allowing for our limited knowledge of their complete structure, unless it be with *P. subsagittatus*. The very wide and concave area anterior to the glabella and upturned anterior limb seems to point to this.

PTYCHOPARIA (?) AUSTRALIS, H. Woodward.

Pl. xxxix., fig. 6.

Conocephalites australis, H. Woodward: Geol. Mag., i. (3), 1884, p. 344, pl. xi., fig. 2a, b.

Sp. Chars.—Glabella oblong, almost parallel-sided posteriorly, the lateral margins barely tapering until near the

front, which is broadly rounded; glabella furrows in two pairs, the first pair all but circumscribing the basal lobes; axial furrows deep and well marked. Neck lobe in comparison to the size of the glabella broad and large, its furrow particularly deep. Fixed cheeks only partially preserved, but apparently wide. Surface minutely granular.

Obs.—The replicas do not display any traces of the facial sutures, ocular ridges, or eyes, nor is there any trace of the oblique striae “seen on the cheek in advance of the eye which spread from it to the anterior border of the glabella.” The space occupied by an eye “on the anterior half of the head,” as well as that by the oblique striae, appear to me merely as fractured matrix surfaces.

Loc.—Yorke Peninsula, South Australia (Woodward).

Hor.—Parara Limestone, Lower Silurian (Woodward); Lower Cambrian (Tate); Upper Cambrian (Howchin); Cambrian (Etheridge).

PTYCHOPARIA (?) HOWCHINI, *Eth. fil.*

Pl. xl., fig. 7.

P. howchini, *Eth. fil.*: Trans. Roy. Soc. S. Austr., xxii., 1888, p. 2, pl. iv.

Obs.—At the time I described this imperfect cephalon I compared it with Woodward’s “*Conocephalites australis*,” but relying on the supposed accuracy of the figures given, believed them to be distinct. I now find the general aspect of the glabella of *P. howchini* to so closely resemble that of the replicas of Woodward’s species that suspicion is raised of the identity of the two; but like so many other questions connected with these Cambrian Trilobites, this possibility must remain in that sense only for the present.

Loc.—Ardrossan, North-east Yorke Peninsula (Howchin).

Hor.—Lower Cambrian, or “Olenellus Group” (Tate); Upper Cambrian (Howchin); Cambrian (Etheridge).

PTYCHOPARIA ALROIENSIS, n. sp.

Pl. xl., fig. 8.

Trilobite cast., Anon.: Bull. N. Territory, No. 14, 1910, pls. ii. and iii.

Sp. Chars.—Cephalon semicircular (when perfect). Glabella obtusely conical, rounded in front, separated from the fixed cheeks and anterior limb by well-marked deep axial grooves; two pairs of furrows, the basal pair circumscribing prominent basal lobes; fixed cheeks comparatively large, but less convex than the glabella; palpebral lobes small, the connecting eye-lines, or ocular ridges, situated just in advance of the anterior pair of glabella furrows, anterior limb like the

fixed cheeks gently convex, in the same plane as the glabella, separated from the anterior margin or fillet, which is cord-like and prominent, by a shallow groove; neck-ring in its median portion comparatively thick, its groove well defined. Facial sutures in front of the palpebral lobes almost longitudinally straight, really very slightly convex, posterior to them curving downwards with a concave sweep and sharply outwards in the direction of the genal angles.

Thoracic somites fourteen⁽³⁹⁾; axis elongately and narrowly obconical, gently convex; axial grooves wide and open. Pleurae arched, angular in the middle line, each strongly grooved or furrowed, the proximal half horizontally so, the distal obliquely bent. Pygidium small, of two (or perhaps three) coalesced segments, and a small terminal appendage; those of the pleurae deflected backwards to a slight degree; posterior margin truncate and nearly straight.

Obs.—I am indebted to both the Federal Director of Mines at Darwin and Corporal A. L. Merrotsy, 13th Field Company, Australian Engineers, for replicas of this Trilobite, from which the foregoing description was drawn up. I believe this to be the most complete Cambrian form yet found in Australia, and a very compact little body it is.

There appears to be, judging by Mr. C. D. Walcott's numerous figures, considerable latitude in the number of glabella furrows and tail segments in *Ptychoparia*; in the former from none to three (the last predominating), and in the latter from four to seven (again the last typical). In the present instance the facial sutures and number of thoracic segments are in order, but in the possession of only two pairs of glabella furrows, and a decreased series of pygidical segments, it is not in accord with strict precedent.

Loc.—Eight miles east of Alroy Downs, Barkly Tableland, Northern Territory (Merrotsy).

Hor.—Cambrian (Etheridge).

Genus REDLICHIA, Cossmann, 1902.

Hoeferia, Redlich: Cam. Fauna E. Salt Range (Pal. India, n.s., i., pt. 1, 1899), p. 2.

Redlichia, Cossmann: Revue Crit. Pal., 6th Ann., No. 1, 1902, p. 52.

Redlichia, Walcott: Proc. U.S. Nat. Mus., xxix., 1905, p. 24.

Obs.—Described by Dr. Redlich as a Trilobite with a semicircular cephalon, and free cheeks armed with genal spines; a cylindrical glabella provided with four pairs of furrows, and palpebral lobes which surround the glabella in

(39) The first thoracic segment is not shown in the figure; it is more or less tucked under the neck ring.

continuous curves independent of the latter, and not confluent as in *Olenellus*. The fixed cheeks are very narrow, whilst the facial sutures are much pinched-in at the anterior ends of the palpebral lobes, giving to the antero-central portion of the cephalic shield a very characteristic "halbert"-shaped appearance.

To this genus I now refer *Olenellus* (?) *forresti*, Eth. *fil.*, and Foord, from Kimberley. A glance at Mr. A. H. Foord's figure⁽⁴⁰⁾ will at once reveal the very close resemblance existing between *O.* (?) *forresti* and Redlich's *Hoeferia noetlingi*, the type species of *Redlichia*, and following Mr. Walcott's suggestion⁽⁴¹⁾ I now transfer it to that genus.

REDLICHIA FORRESTI, Eth. *fil.* and Foord.

Olenellus (?) *forresti*, (Eth. *fil.*, m.s.) Foord: Geol. Mag., vii. (3), 1890, p. 99, pl. iv., figs. 2a, b.

Protolenus forresti, Matthew: Canadian Rec. Sci., v., 1892, p. 253.

Obs.—Mr. G. F. Matthew suggested the reference of this Trilobite to his genus *Protolenus* on account of its continuous eye lobes. He remarked that these continuous eye lobes "are close to the glabella, leaving a very narrow fixed cheek. The eye lobes and the middle piece of this head-shield are well defined, and give no reason for supposing that the outer cheek was fixed, without which the reference to *Olenellus* is inadmissible."

In opposition to Mr. Matthew's suggestion I would observe:—

1. The general appearance of the glabella, fixed cheeks, and eye lobes respectively in *Olenellus* (?) *forresti* is very different from that of Matthew's type, *Protolenus elegans*.

2. The glabella in *Protolenus* bears three pairs of lateral furrows, but in the Australian Trilobite these furrows are continuous, and said to be four in number.

3. In Matthew's type a pygidial telson is unknown, but he informs us that "such an appendage exists in a Sardinian species, and is like that of *Paradoxides* (or *Olenus*)."⁽⁴²⁾ Mr. Foord remarked:—"From the same locality as the head just described there is a short spine (fig. 2a), probably belonging to the present species; if so, it would be the telson." I, however, suggest it may be one of the genal spines and therefore quite in keeping with the structure of *Redlichia*.

(40) Foord: Geol. Mag., vii. (3), pl. iv., figs. 2a, b.

(41) Walcott: Smithsonian Miscel. Collns., 64, No. 1, 1914, p. 62.

(42) Foord: Geol. Mag., vii. (3), 1890, p. 99.

Again, Mr. Foord figured the half of a thoracic segment precisely like those ascribed to the same genus, grooved pleurae terminating distally in a short backwardly directed spine.

Loc.—(1) Elvira River bed, south of base line Z, 27 (H. B. 27); (2) Ord River bed, five miles below the Elvire Junction, opposite Hill J., 38 (H. B. 84).⁽⁴³⁾

Hor.—Salterella Limestone, Cambrian (Etheridge).

I have before me a single poorly preserved specimen, like and yet unlike *R. forresti*. The glabella and fixed cheeks are the only portions of the cephalic shield clearly distinguishable. The former is narrow and cylindrical, decreasing in width forwards, with three continuous grooves. The fixed cheeks are wider than in *R. forresti*, and the palbebral lobes describe wider semicircles. The neck lobe is prominent and large, with a small central granule just above the posterior margin. There are five thoracic segments attached, each apparently bearing a central granule, or perhaps even a spine base, as that on the fifth axis is larger than the others, and projects exactly as the broken base of a spine would. The pleurae are short and, so far as the condition of preservation permits one to judge, of the *Redlichia* type. The fifth is distally terminated (seen on right-hand side) by a much longer, backwardly-directed acuter spine, longer than in the corresponding part of either *Redlichia noetlingi* or *R. forresti*. The precise relation of this fossil to the lastnamed Trilobite is not at present clear; it may be distinct, or, on the other hand, notwithstanding the trivial differences pointed out above, possibly an advance in the known structure of *R. forresti*.

Loc.—Kelley Creek, Ord River Station (Miss E. Helms).

Hor.—Salterella Limestone, Cambrian (Etheridge).

REDLICHIA THIELEI, Chapman.

Ptycoparia thielei, Chapman: Proc. Roy. Soc. Vict., xxiii., pt. ii., 1911, p. 316, pl. lviii., figs. 2, 3, 5, 7, 10.

Redlichia thielei, Walcott: Smithsonian Miscel. Collns., 64, No. 1, 1914, p. 62.

Obs.—By Mr. Walcott this species is referred to *Redlichia*,⁽⁴⁴⁾ and is remarkable in the possession of four pairs of glabella furrows. The presence of the long narrow glabella reminds us of that of those termed *Ptycoparia subsagittatus* and *P. tatei*.

⁽⁴³⁾ Glauert: Rec. W. Austr. Mus. and Art Gallery, i., pt. 2, 1912, p. 72.

⁽⁴⁴⁾ Walcott: Smithsonian Miscel. Collns., 64, No. 1, 1914, p. 62.

Loc.—Dolodrook River, Mount Wellington District, Gippsland, Victoria (Chapman).

Hor.—"Agnostus zone," Upper Cambrian (Chapman).

REDLICHIA(?) MINIMA, Chapman.

Ptychoparia minima, Chapman: Proc. Roy. Soc. Vict., xxiii. (n.s.), pt. ii., 1911, p. 318, pl. lviii., figs. 1 and 6(?), pl. lix., fig. 22.

(?) *Proetus*(?), sp. nov., Chapman: *loc. cit.*, xxi. (n.s.), pt. i., 1908, p. 269.

Obs.—I think this form will be more appropriately placed in *Redlichia* than in *Ptychoparia*. The distinguishing features are the peculiarly dwarfed and semicircular palpebral lobes, which lend to this cephalon a somewhat remarkable appearance, and the "neck-ring showing traces of a slight ridge bearing three small blunt spines directed posteriorly."

Loc.—Dolodrook River, Mount Wellington District, Gippsland, Victoria.

Hor.—"Agnostus zone," Upper Cambrian (Chapman).

Genus DIKELOCEPHALUS, D. D. Owen, 1852

(Rep. Geol. Sur. Wisconsin, Iowa, and Minnesota, 1852, p. 573).

DIKELOCEPHALUS FLORENTINENSIS, Eth. *fil.*

D. florentinensis, Eth. *fil.*: Rec. Austr. Mus., v., No. 2, 1904, p. 25, pl. x., fig. 4.

Obs.—Known only as a pygidium, presenting the typical features of that of the genus. The axis consists of seven segments and a terminal appendage. The flattened side lobes consist of seven or eight pleurae, and there is a wide striated limb. From the ventral margin, opposite to the last but one pleura on each side, projects a short pygidial spine.

Loc.—Florentine Valley, Western Tasmania (T. Stephens).

Hor.—Cambrian (Etheridge).

Genus CREPICEPHALUS, D. D. Owen, 1852 ⁽⁴⁵⁾

(Rep. Geol. Sur. Wisconsin, Iowa, and Minnesota, 1852, p. 576).

CREPICEPHALUS ETHERIDGEI, Chapman.

(?) *Cheirurus*, Chapman: Proc. Roy. Soc. Vict., xxi. (n.s.), pt. i., 1908, p. 269.

Crepicephalus etheridgei, Chapman: *Ibid*, xxiii. (n.s.), pt. ii., 1911, p. 319, pl. lviii., fig. 8.

Crepicephalus etheridgei, Walcott: Smithsonian Miscel. Collns., 64, No. 3, 1916, p. 203.

Obs.—The hitherto existing confusion between the genera *Dikelocephalus* and *Crepicephalus* has been dispelled

(45) Redefined, Walcott, 1916.

by the labours of Mr. C. D. Walcott. So far as the pygidia are concerned, those with broad flattened borders, or limbs, and the posterior spines when present short and thorn-like are *Dikelocephali*, whilst, on the other hand, similar pygidia with the spines extending backwards from a broad base long, narrow, and sharp; or the spines in question attached to the sides of the pleural lobes, appertain to *Crepicephalus*.

Loc.—Dolodrook River, Mount Wellington District, Gippsland, Victoria (Chapman).

Hor.—"Agnostus zone," Upper Cambrian (Chapman).

CREPICEPHALUS TASMANICUS, Eth. *fil.*

Dikelocephalus tasmanicus, Eth. *fil.*: Proc. Roy. Soc. Tas., 1882 (1883), p. 155, pl. i., fig. 4.

(?) *Conocephalites stephensi*, Eth. *fil.*: *Loc. cit.*, p. 153, pl. i., figs. 1-3.

Obs.—Misled formerly by the descriptions of the late Prof. James Hall, of Albany, I referred this pygidium to *Dikelocephalus*, but it appears to be that of a *Crepicephalus*, although not a highly typical one, owing to the narrowness of the posterior portion of the limb.

I am now of opinion that this pygidium, and the part cephalon I described at the same time as *Conocephalites stephensi*, will prove to be portions of one and the same species. Since my paper was written, now many years ago, I have examined a quantity of the Caroline Creek deposit. One result of this is an inability to find any pygidia likely to associate themselves with the "Conocephalites" cephalon other than the "Dikelocephalus" tail, or *vice-versa*. I can, therefore, only conclude they are one and the same.

The cephalon called *C. stephensi* was, I believe, one of the first, if not the first, Cambrian Trilobite portion to be described in detail from Australasia.

Loc.—Caroline Creek, near Latrobe, Tasmania (T. Stephens).

Hor.—Potsdam Sandstone or Lingula Flags (Etheridge); "Dikelocephalus Group" (R. M. Johnston); Upper Cambrian (L. K. Ward); Cambrian (Etheridge).

Genus NOTASAPHUS, Gregory, 1903

(Proc. Roy. Soc. Vict., xv. (n.s.), pt. ii., 1903, p. 155).

NOTASAPHUS FERGUSONI, Gregory.

N. fergusonii. Gregory: *Loc. cit.*, p. 155, pl. xxvi., figs. 11-13.

Obs.—The cephalon of *Notasaphus*, so far as known to us, is certainly distinct from that of *Dinesus*, but if the figures are a correct representation of the fossil, it is very difficult

to say to what genus the remains really belong; amongst other genera *Corynexochus*, or perhaps *Blountia*, may put in a claim.

Loc.—Neighbourhood of Mount Ida, Heathcote, Victoria (Gregory).

Hor.—Ordovician (Gregory); Cambrian (Etheridge).

CAROLINE CREEK TRILOBITE REMAINS.

In my early account of these casts I figured, but left unnamed, portions of four cephalons. In each instance a glabella was preserved, parts of the neck-rings and anterior limbs, and traces of the fixed cheeks. All four types have certain features in common, such as the broad, short glabellae, deeply excavate anterior areas with thick and prominent limbs, and deep neck furrows; they differ only in proportional measurements and numbers of pairs of glabella furrows.

Since 1882 I have had opportunities to examine other examples of the Caroline Creek grit in which these remains occur plentifully, but always found the latter in the same tantalizing imperfect condition. In the absence of complete fixed and free cheeks it is most difficult to suggest a generic reference with any degree of certainty, but in my original remarks I compared one to *Loganellus*, Devine, and another to *Bathyrurus*, Billings.⁽⁴⁶⁾ In a later communication I suggested *Ptychoparia*,⁽⁴⁷⁾ and for merely descriptive purposes perhaps here these cephalons had better remain tentatively. At the same time other genera than those mentioned put in a claim, such as *Bathyrurellus*, Billings; *Chuangia*, Walcott; or even *Pagodia*, Walcott.

PTYCHOPARIA(?) CAROLINENSIS, n. sp.

Head shield, (?) *Conocephalites*, Etheridge: Proc. Roy. Soc. Tas., 1882 (1883), pp. 156 and 162, pl. i., figs. 8 and 9, (?) fig. 11.

Loganellus (?) or *Conocephalites* (?), Johnston: Syst. Acc. Geol. Tas., 1888, p. 37.

Chars.—Glabella broad-oval or oblong, rounded anteriorly, and all but in contact with the fillet of the anterior limb, broad posteriorly; fillet and neck-ring prominent, the neck furrow deep; two pairs of glabella furrows, basal and middle.

Obs.—The outline of the glabella (figs. 8 and 9) and that of fig. 11 are remarkably alike, and it is possible they may be identical as to species.

(46) Etheridge: Papers and Proc. Roy. Soc. Tas., 1882-3 (1883).

(47) Etheridge: Trans. Roy. Soc. S. Austr., xxxii., 1882, p. 3.

• PTYCHOPARIA(?) JOHNSTONI, n. sp.

Second species, Etheridge: Proc. Roy. Soc. Tas., 1882 (1883), pp. 157 and 162, pl. i., fig. 10.

Loganellus(?) or *Conocephalites*(?), sp., Johnston: Syst. Acc. Geol. Tas., 1888, p. 37.

Cars.—Glabella slightly pyriform, narrowing posteriorly, its anterior margin separated from the limb-fillet by a wide and deep frontal groove; limb-fillet thick and prominent; axial grooves deep and well marked; two pairs of pit-like furrows, basal and middle.

Obs.—Name suggested in memory of the late Mr. R. M. Johnston, Government Statist of Tasmania, etc. This is, in all probability, quite distinct from the original figs. 8, 9, and 11.

PTYCHOPARIA(?) TASMANIENSIS, n. sp.

Fragmentary head shield, allied to Bathyrus, Etheridge: Proc. Roy. Soc. Tas., 1882 (1883), p. 157, pl. i., fig. 12.

Bathyrus(?), sp., Johnston: Syst. Acc. Geol. Tas., 1888, p. 37.

Sp. Chars.—Glabella nearly quadrate, short, blunt anteriorly, but with the margin slightly rounded, expanding very little forwards; fillet of the limb narrow but prominent; fixed cheeks probably broad; neck furrow deep.

Obs.—Furrows are not visible on this glabella; it is shorter than either of the other forms, and blunter anteriorly.

In addition to the cephalic portions already described, there occur both in the Caroline Creek beds and those of the Florentine Valley certain pygidia of a very marked character.

Those from the first locality I tentatively referred to two forms of *Asaphus*.⁽⁴⁸⁾ They are nearly semicircular, differing rather in outline, but both with pronounced segmented axes, one with ten, the other eight segments. Both have well-marked striated limbs, but in one (fig. 6), the axis enlarges forwards much more rapidly than that of fig. 5.

The imperfection of the record renders accurate recognition of these pygidia difficult. A reference to *Bathyrus* even is, to some extent, possibly permissible, for although in most species of *Bathyrus* the pygidial pleurae are segmented, in *B. saffordi*, Billings,⁽⁴⁹⁾ only the axis is so, precisely as in the fossils under review. Furthermore, the glabellae, fixed cheeks, etc., are remarkably similar to those of that genus. In the same category stands *Asaphiscus*, Meek, but

⁽⁴⁸⁾ Etheridge: Proc. Roy. Soc. Tas., 1882 (1883), p. 156, pl. i., figs. 5 and 6.

⁽⁴⁹⁾ Billings: Canadian Pal. Foss., i., 1865, p. 259, fig. 241.

here we are faced by the negative fact that no *Asaphiscus*-like cephalons have so far been discovered at Caroline Creek, that is to my knowledge.

In the Florentine Valley extension there also occur very similar isolated pygidia that I referred to *Niobe*.⁽⁵⁰⁾ In these tails, varying from semicircular (correct outline) to deltoid-triangular (distorted outline), are long, narrow, segmented axes, with indistinct traces of pleural subdivision on the lateral lobes. The limbs, as in those of the Caroline Creek specimens, are broad and continuous. In all probability, to whatever genus these latter pygidia may in the future be relegated, those occurring in the Florentine Valley will follow suit.

DESCRIPTION OF PLATES.

PLATE XXXIX.

Olenellus (?), sp., or *Ptychoparia* (?), sp.

Fig. 1. Fragmentary cephalon (figured in Trans. Roy. Soc. S. Austr., xxix., pl. xxv., fig. 1). $\times 2$ diam.

Ptychoparia (?) *tatei*, H. Woodward, sp.

Fig. 2. Imperfect cephalon, from a replica of Woodward's original specimen of *Dolichometopus tatei* (figured in the Geol. Magazine, i., 1884, pl. xi., fig. 3). $\times 8$ diam.

Fig. 3. Imperfect cephalon, from one of Tate's original specimens of *Olenellus pritchardi* (figured in Trans. Roy. Soc. S. Austr., xv., pt. 2, 1892, pl. ii., fig. 11). $\times 4$ diam.

Ptychoparia (?) *subsagittatus*, Tate, sp.

Fig. 4. Imperfect cephalon, from one of Tate's original specimens of *Microdiscus subsagittatus* (figured in Trans. Roy. Soc. S. Austr., xv., pt. 2, 1892, pl. ii., fig. 12). $\times 6$ diam.

Fig. 5. Another similar example of Tate's, but not previously figured. The glabella furrows are distinctly visible in this specimen. $\times 6$ diam.

Ptychoparia (?) *australis*, H. Woodward, sp.

Fig. 6. Imperfect cephalon, from a replica of Woodward's original specimen of *Conocephalites australis* (figured in the Geol. Magazine, i., 1884, pl. xi., figs. 2a, b). Nat,

PLATE XL.

Ptychoparia (?) *howchini*, Eth. fl.

Fig. 7. Greater portion of a cephalic shield, from the original specimen (figured in Trans. Roy. Soc. S. Austr., xxii., 1888, pl. iv.). $\times 2$ diam.

Ptychoparia alroiensis, Eth. fl.

Fig. 8. Nearly complete Trilobite, from a replica of the original specimen (figured in the Northern Territory Bulletin, 1910, pls. ii. and iii.). $\times 4$ diam.

The illustrations were obligingly prepared for the writer by Mr. J. R. Kinghorn, of the Australian Museum, Sydney.

(50) Etheridge: Rec. Austr. Mus., v., No. 2, 1904, p. 26, pl. x., figs. 1-3.